Tech Transfer Highlights

Vol. 12 No. 1 2001

Argonne National Laboratory

The latest technological innovations and scientific advances from Argonne National Laboratory

Many Argonne technologies are available for commercialization under a variety of agreements. For more information, contact the Office of Technology Transfer (800-627-2596, partners@anl.gov). For Media Relations, contact Catherine Foster (630-252-5580, cfoster@anl.gov).

New Fuel Cell Catalyst Isn't Fussy About Fuels

U.S. Department of Energy

Office of Energy Efficiency and Renewable Energy, Office of Advanced Automotive Technologies

An Argonne researcher displays a new catalyst that could help bring ultra-efficient, environmentally friendly electric cars to the marketplace.

A partial oxidation catalyst, developed and patented by Argonne, will be manufactured and distributed by Süd-Chemie Inc. (formerly United Catalysts Inc.) under a licensing agreement with Argonne. The new "fuel-flexible" catalyst forms the heart of a component (a fuel processor) that will allow fuel-cell-powered cars to run on conventional fuels. It helps convert a wide variety of hydrocarbon fuels, including gasoline, natural gas, and methanol, into the hydrogen-rich gas needed to power fuel cells. This is in contrast to other catalysts that typically function with only a single fuel.

The Argonne catalyst also demonstrates excellent resistance to the sulfur impurities found in some fuels, a property that is essential for reliable, long-term operation of a fuel processor. Commercialization of the fuel-flexible catalyst could encourage fuel cell development by offering automakers the widest possible market for their vehicles.

In the late 1980s, Argonne began exploring the catalytic conversion ("reforming") of liquid fuel to hydrogen inside a fuel cell system. Argonne's new catalyst resulted from the discovery of a class of materials that support the chemistries for partial oxidation of gasoline and other liquid fuels (partial oxidation is the primary reaction by which hydrocarbon fuel is converted into hydrogen). The catalyst could also be used in fuel cells designed for stationary-power applications, such as residential buildings and remote locations. Depending on the commercial success of fuel cells, the worldwide market for catalysts of this type could be as large as a half-billion dollars per year within 10 years.
http://www.techtransfer.anl.gov/partners/sud-chemie.html

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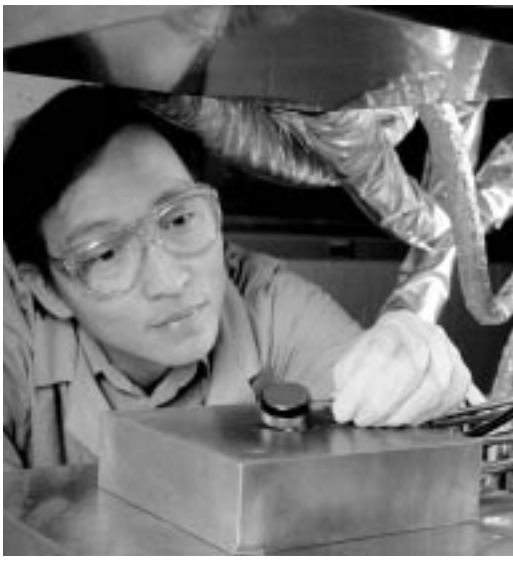
Sensor Measures High Temperatures at the Speed of Sound

U.S. Department of Commerce

Advanced Technology Program



An Argonne researcher prepares to test a sensor that uses ultrasonic transducers to obtain temperature readings up to 3000°C.

Working with Superior Graphite Co., Argonne scientists have developed a nonintrusive, real-time sensor that measures temperatures up to 3000°C with 2-3% accuracy. The sensor uses two ultrasonic transducers to make speed-of-sound measurements that are converted into temperature readings.

Superior Graphite sought development of the sensor to provide closed-loop temperature control in its Electroconsolidation® process, which can be used to manufacture parts from powders of many different materials, including metals, ceramics, and polymeric composite materials.

Argonne's technique measures the speed of pulsed ultrasonic waves as they traverse a bed of graphite powder containing one or more preformed parts. The transmitting and receiving transducers are placed on either side of the process die so that they won't affect the sintering/densification operation.

By providing closed-loop temperature control, Argonne's sensor enables a higher degree of process repeatability.
http://www.techtransfer.anl.gov/partners/superior-graphite.html

Real Power in Power Plant Simulation Software

U.S. Department of Energy

Office of Energy Efficiency and Renewable Energy, Office of Transportation Technologies, Office of Advanced Automotive Technologies

Argonne's GCTool software package lets engineering designers "try out" different system configurations without the expense and delay of actually building numerous prototypes. GCTool was developed specifically for designing, analyzing, and comparing fuel cell and other power plant configurations, including automotive, space-based, and stationary systems. Its strength is dynamic, total fuel cell system modeling. Models for four different fuel cell types are available: polymer electrolyte, phosphoric acid, molten carbonate, and solid oxide fuel cells. GCTool provides a convenient, flexible framework for integrating various component models into simple or complex system configurations. Operating in the Windows/95/98/NT environment, the simulated systems can have equality or non-equality constraints, as well as recycle loops. An optimizer facility allows the user to define an objective function to be minimized subject to real-life nonlinear constraints. A library of subcomponent models and properties is available, and users can easily add their own models as needed. With its tremendous adaptability, Argonne's GCTool can be applied to a broad range of energy conversion systems.

The GCTool software is highly user-friendly. System configurations are set up using an interpreted C-like language. Different pop-up windows show the system diagram, all model parameters (which can be altered interactively, if desired), and the simulation output.

Argonne is using GCTool to help guide fuel cell vehicle research.
http://www.techtransfer.anl.gov/software/gctool.html
http://www.transportation.anl.gov/ttrdc/modeling/gctool-new.html

New Nanofluids Can Take The Heat

U.S. Department of Energy

Office of Science, Basic Energy Sciences
Office of Energy Efficiency and Renewable Energy, Office of Transportation Technologies, Office of Heavy Vehicle Technologies

There is a great need for more efficient heat transfer fluids in many industries, from transportation to energy supply to electronics. Now, thanks to a team of Argonne scientists and engineers, the coolants, lubricants, oils, and other heat-transfer fluids used in today's thermal systems – such as radiators, engines, and HVAC equipment – could soon be transferring heat many times faster than they currently do.

Heat transfer fluids used in today's conventional thermal systems have poor heat transfer properties. Adding millimeter- or micrometer-sized particles does not work with emerging "miniaturized" technologies, because the particles can clog in the very small "microchannels" of heat exchangers.

A research team at Argonne created "nanofluids" (tiny solid particles suspended in fluid) that can conduct heat ten times faster than scientists had predicted possible. Solid particles conduct heat better than liquid does. Nanoparticles stay suspended much longer than larger particles in liquid because of their small size (less than 40 nanometers, or one-thousandth the diameter of a human hair). The size of nano-particles also means they can interact with liquid at the molecular level. This appears to be the reason that nanofluids can conduct heat so much faster than conventional heat transfer fluids.

Argonne's research could lead to a major breakthrough in making new composite (solid and liquid) materials for numerous engineering and medical applications. Better ability to manage thermal properties translates into greater energy efficiency, smaller and lighter thermal systems, lower operating costs, and a cleaner environment.
http://www.techtransfer.anl.gov/techtour/nanofluids-summary.html

Argonne's Radiochemistry Expertise Helps Start-up Company Grow

SourceTech Medical

Argonne and STM researchers watch as titanium capsules containing radioactive iodine pass through STM's assembly system, where the capsules are manufactured and visually inspected.

SourceTech Medical (STM), a start-up company based in the Chicago area, sought Argonne's help in developing a new way of producing radioactive medical "seeds" for use as permanent implants in treating the early stages of prostate cancer. Argonne researchers devised a reliable manufacturing method for depositing radioactive iodine (I-125) onto substrates that could be sealed inside titanium capsules, which are each about the size of a grain of rice. The collaboration enabled the company to rapidly respond to a growing medical-industry demand for radioactive seeds.

STM recently finished construction on a new facility and is currently manufacturing and distributing the I-125 seeds throughout the United States.

STM found that working with Argonne was very cost-effective because it gave the company access to the laboratory's expertise and advanced facilities, and helped avoid the upfront expenses associated with expanding its own research staff and investing in costly laboratory equipment. Both savings were critical to STM's quick entry into the radioactive seed marketplace.
http://www.techtransfer.anl.gov/partners/sourcetech.html

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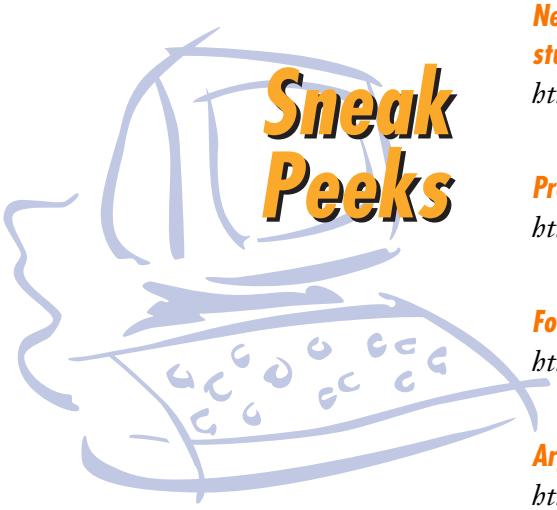

New radiographic diagnostic technique uses time-resolved synchrotron X-rays to study the dynamic characteristics of fuel sprays
http://www.transportation.anl.gov/ttrdc/engine/ct15-APS.html

Protein structures solved faster with more detail than ever
http://www.anl.gov/OPA/frontiers/b1excell.html

Four Argonne technologies win Energy 100 Awards
http://www.techtransfer.anl.gov/awards/energy-100.html

Argonne environmental cleanup work named best in six-state region
http://www.anl.gov/OPA/whatsnew/epaaward01.htm

Argonne team demonstrates promising solution to nuclear waste disposal
http://www.anl.gov/OPA/whatsnew/solventextraction.htm

Tech Transfer *Highlights*

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